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July 19, 1996

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William F. Caton, Acting Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, D.C. 20554

Re: CellNet Data Systems, Inc.
ET Docket No. 96-8; RM-8435, RM-8608, RM 8609

Dear Mr. Caton:

We hand you herewith on behalf of CellNet Data Systems, Inc.
an original and four copies of its Reply Comments in the above-
referenced proceeding.

Should you have any questions regarding this submission,
please contact the undersigned.

Sincerely,

WILKINSON, BARKER, KNAUER & QUINN

By: Lawrence J. Movshin
Jeffrey S. Cohen

Enclosures

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BEFORE THE
Federal Communications Commission
WASHINGTON, DC 20554

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JUL 19 1996

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

In the Matter of)	
)	
Amendment of Parts 2 and 15)	ET Docket No. 96-8
of the Commission's Rules)	RM-8435, RM-8608, RM-8609
Regarding Spread Spectrum Transmitters)	

REPLY COMMENTS
OF
CELLNET DATA SYSTEMS, INC.

CellNet Data Systems, Inc. ("CELLNET"), by its attorneys and pursuant to Section 1.415 of the Commission's Rules, hereby replies to some of the Comments filed in response to the *Notice of Proposed Rule Making* in the above-referenced proceeding. For the reasons discussed below, CELLNET urges that the Commission should not make fundamental changes in its original conclusion concerning short-duration transmission systems. While alternative approaches that obtain all of the benefits of spread spectrum technology may be allowed under appropriate circumstances, as a general rule products being authorized under Section 15.247 must be capable of acting as a frequency hopping system, and not merely exhibit some of the characteristics of such devices.

CELLNET has spent more than seven years developing a fixed, low-cost, highly efficient automated metering and wireless

¹ *Amendment of Parts 2 and 15 of the Commission's Rules Regarding Spread Spectrum Transmitters, Notice of Proposed Rule Making*, 11 FCC Rcd. 3068 (1996).

data monitoring system using spread spectrum technology, primarily targeted to the metering needs of the electric and gas utilities. Since the Commission's 1989 decision in Gen Docket 87-389 to encourage development of the ISM bands for low cost, low-power transmissions by Part 15 devices,² CELLNET has concentrated its primary development efforts in the 902-928 MHz band, and the local area network component of its CellNet™ system currently operates on a micro-cellular configuration in that band.

CELLNET, in its own right and as an active member of the Part 15 Coalition and its technical subcommittee, has previously participated in many FCC proceedings dealing with the FCC's efforts to increase spectrum efficiency in the design of licensed and unlicensed devices. The instant proceeding represents another such opportunity.

By clarifying and modifying the rules applicable to spread spectrum products, the Commission can further expand the opportunity for manufacturers and service providers who utilize this highly efficient technology to increase the types of unlicensed products that are available in the marketplace. At the same time, the Commission must remain sensitive to the potential that too liberal an interpretation of its rules could lead to spectrum inefficiencies and congestion. In such cases, the result will not be greater spectrum utilization, but instead

² See GEN. Docket No. 87-389, *First Report and Order*, 4 FCC Rcd. 3493 (1989).

a reduction in the usefulness and/or increased cost for existing and future products.

Much of the growth in unlicensed devices can be traced to the Commission's decisions in 1989 and 1990 in Dockets 87-389 and 89-354³ to provide for expanded, generally flexible uses of the ISM bands with somewhat higher emission field strengths under § 15.249, and a concomitant modification and liberalization of the technical rules for spread spectrum devices under § 15.247, allowing even higher output power for devices using this type of technology. The Commission rationalized the higher power limits in § 15.247 by the fact that spreading reduces the power density of the signal at any frequency within the transmitted bandwidth, thereby reducing the probability of interference to other signals; at the same time, undesired signals are suppressed, thus increasing the tolerance of such systems to other users of the same frequencies.

The substantial growth of unlicensed products utilizing spread spectrum technology in the 902-928 MHz band, with few interference problems to other licensed or unlicensed devices, demonstrates the appropriateness of the Commission's conclusions. And as a general matter, CELLNET agrees with the Commission's proposals for modifying and clarifying the existing standards, all of which should improve spectrum utilization without increasing the potential for interference.

³ See GEN. Docket No. 89-354, *Report and Order*, 5 FCC Rcd. 4123 (1990).

In the NPRM, the Commission has also addressed the "short duration transmissions" issue.⁴ In some instances, a device can transmit all required information on a single channel in a short duration burst, similar to a single burst from a frequency hopping system. The NPRM concluded that a transmission that does not hop does not exhibit any of the characteristics of a spread spectrum system, e.g., processing gain exhibited by the receiver. Absent processing gain, a system employing short transmission bursts must transmit at higher power levels than would be required by a spread spectrum system, increasing the potential for harmful interference to other users. The FCC therefore concluded not to extend the benefits of § 15.247 to such devices.

Several commenters favored changes to the rules to accommodate short duration systems. Alliant Techsystems, for example, urged that the FCC should authorize devices that utilize infrequent short bursts of less than 5 milliseconds at an average rate of less than .1 transmissions per hour, whether frequency hopping or not.⁵ Master Lock argued that short duration transmissions should be permitted if the system can frequency hop on a pseudo-random basis if presented with a data stream that cannot be accommodated by a single hop.⁶ Itron takes a similar

⁴ 11 FCC Rcd. at 3075.

⁵ Alliant Comments at 5.

⁶ Master Lock Comments at 3.

approach, arguing that only if more than one 400 ms transmission is required to transit all information should a hop to another channel and formal synchronization be required.⁷

As a general matter, CELLNET does not disagree with Master Lock and Itron. As Itron properly notes, however, a key element of a spread spectrum architecture is that all messages sent from the transmitter are utilized at the receiver, in order to assure a high level of processing gain in the system. If any changes are to be made to the rules to accommodate such systems, then this same philosophy must govern their design. As the Commission noted in adopting the liberalized spread spectrum rules (in Docket 89-354) "in the absence of a processing gain requirement . . . [d]evices could be designed to take advantage of the 1 Watt power provision by generating spread bandwidths where much of the energy is completely unnecessary for communications. These unnecessary signals constitute an inefficient use of the radio spectrum."⁸ The agency noted then that spectrum efficiency required that the Commission take steps to ensure against the transmission of radio frequency energy that services no useful purpose for communication, may result in interference and can be avoided.

⁷ Itron Comments at 4.

⁸ 5 FCC Rcd. at 4125. The Commission went on to note that applying the definitional requirements only to transmitters would undercut the intent of the spread spectrum liberalizations by encouraging "systems that generate broad bandwidths only to take advantage of the 1 Watt permitted power." *Id.*

Indeed, the Commission noted as to frequency hopping systems, in particular, that the concept of system robustness is important; frequency hopping transmitters and receivers had to be treated as a system in order to ensure that the spectrum efficiencies made possible through true spread spectrum operations are in fact achieved. To that end, receivers intended for use with frequency hopping systems were required to have an input bandwidth that matches the hopping channel bandwidth of the associated transmitter and to hop in synchronization with the transmitter. With these requirements, the Commission believed that processing gains of 15-19 dB could be achieved.

Both MasterLock and Itron recognize the need to maintain this system synchronization in short duration systems in order to obtain the benefits of spread spectrum technology. Itron, for example, urges that parallel receiver architectures, by which a receiver would be required for each transmit frequency on which the short duration transmission would occur, could achieve the same type of processing gain that receiver synchronization obtains. MasterLock similarly recognizes that receiver/transmitter synchronization must be mandated, but urges that a variety of synchronization methods should be allowed that can minimize the air time needed solely for synchronization, particularly where short duration transmissions are required. Each suggests that the Commission allow a pseudo-random "hopping" pattern, by which single transmission bursts would be allowed without "hopping" per se, but only if they appeared on a variety

of channels chosen pseudo-randomly to minimize the interference potential of any single device.

CELLNET recognizes that "spread spectrum" techniques may include **appropriately designed** "short burst" transmission systems. However, any deviation from the classic frequency hopping design in which a minimum number of hops are used and the transmitter and receiver are carefully synchronized has the clear potential for substantially increasing interference to other devices in an already crowded environment. Thus, CELLNET opposes reducing the number of channels on which a system must "hop," for example, to being as few as the eight suggested by Itron. Such a liberalization would statistically increase the number of times that an Itron transmission will appear on any given channel. Rather, by spreading even these short duration transmissions over a larger number of channels, e.g., the 25 channels proposed in the NPRM, the statistical likelihood that a short duration transmission will "crash" with the transmission of another device is necessarily reduced, thereby also reducing the number of retries that either device must create.

Similarly, the Commission must maintain a requirement for clear synchronization of the receiver to the transmitter, as suggested by MasterLock, or alternatively a parallel receiver architecture, as proposed by Itron. Whether or not a synchronized or a parallel receiver architecture is employed, both the transmitter and receiver should have the same number of

channels and the same channel bandwidth. Otherwise, the marketplace will quickly deteriorate into less robust receivers, with little of the benefits of "processing gain" that the existing frequency hopping requirements are designed to achieve.

In short, any design that would result in the creation of transmissions that are not utilized by the system at the receiver to contribute to the overall processing gain of the system will simply pollute already crowded airwaves and cannot be tolerated. Only if short duration systems can exist in a true spread spectrum environment should alternative design approaches be accommodated.

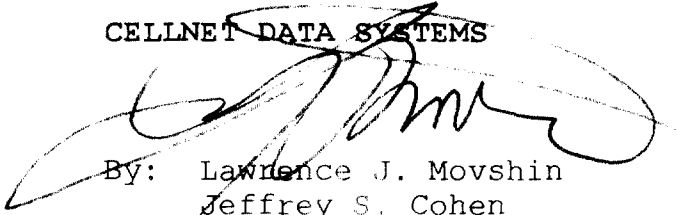
Finally, CELLNET disagrees with the notion raised in the NPRM that any changes to the spread spectrum rules determined in this proceeding should be affected by the final decisions in the Location and Monitoring Services ("LMS") proceeding.⁹ The issues raised in that proceeding relate to the ability of the licensed and unlicensed devices authorized to operate in the 902-928 MHz band to co-exist; they do not change the fundamental specifications contained in Part 15. While CELLNET hopes that the LMS proceeding will further facilitate band sharing, the rules adopted here should not be affected by that proceeding. Rather, this proceeding should move forward to achieve its desired objective: the expansion of the opportunities to take

⁹ 11 FCC Rcd. at 3075.

advantage of the spectrum efficiencies inherent in true "spread spectrum" technologies.

Respectfully submitted,

CELLNET DATA SYSTEMS



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